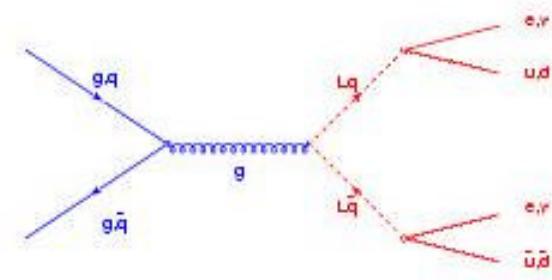
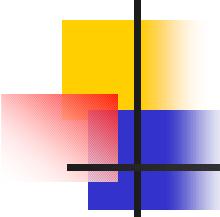


LQ at the TeVatron

- Production
 - $qg \rightarrow LQ + L\bar{Q}$
 - $gg \rightarrow LQ + L\bar{Q}$
 - $q\bar{q} \rightarrow LQ + L\bar{Q}$
- Decay
 - $LQ \rightarrow l^+l^-qq, l^\pm n\bar{q}q, nn\bar{q}\bar{q}$
- Experimental signature:
 - High pt isolated leptons (and/or MET) + jets





LQ production at TeVatron

Code from Michael Kraemer (RAL-TR_97-033)

M_{LQ} (GeV/c ²)	σ (NLO) [pb]
200	0.265E+00
220	0.139E+00
240	0.749E-01
260	0.412E-01
280	0.229E-01
300	0.129E-01
320	0.727E-02

LQ search in eejj

- 2 ele with $E_T > 25$ GeV
- 2 jets with $E_T(j1) > 30$ and $E_T(j2) > 15$ GeV
- removal of events with $76 < M_{ee} < 110$
- $E_T(j1) + E_T(j2) > 85$ GeV $\&\&$ $E_T(e1) + E_T(e2) > 85$
- $\sqrt{(E_T(j1) + E_T(j2))^2 + (E_T(e1) + E_T(e2))^2} > 200$

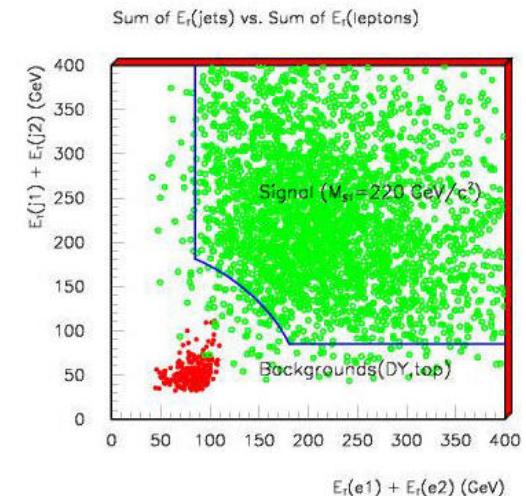
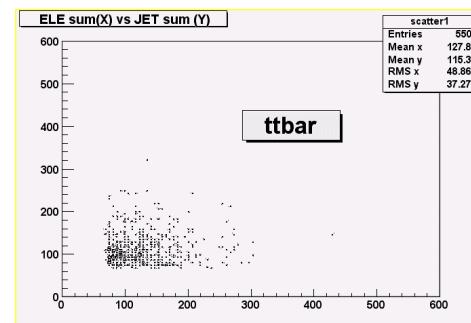
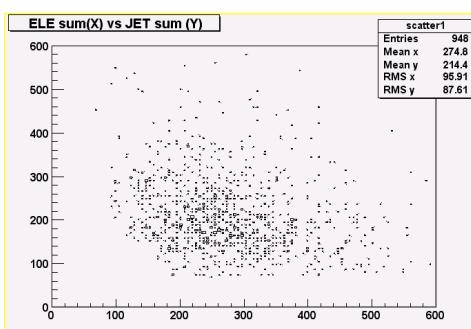
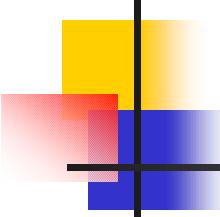


Figure 5.17: This plot shows the distribution of the sum of the corrected E_T 's of the two most energetic electrons versus the sum of the corrected E_T 's of the two most energetic jets for simulated signal (leptoquarks events with $M_{S1} = 220$ GeV/c 2) and for backgrounds (Drell-Yan and $t\bar{t}$ events). The blue right lines show the cuts at 85 GeV in the sums of the leptonic and jet energies, while the arch of circle shows the cut at 200 GeV on the variable $\sqrt{(E_T^2(e1) + E_T^2(e2))^2 + (E_T^2(jet1) + E_T^2(jet2))^2}$, which is the radius of a circle centered in $(0,0)$.



2/21/03

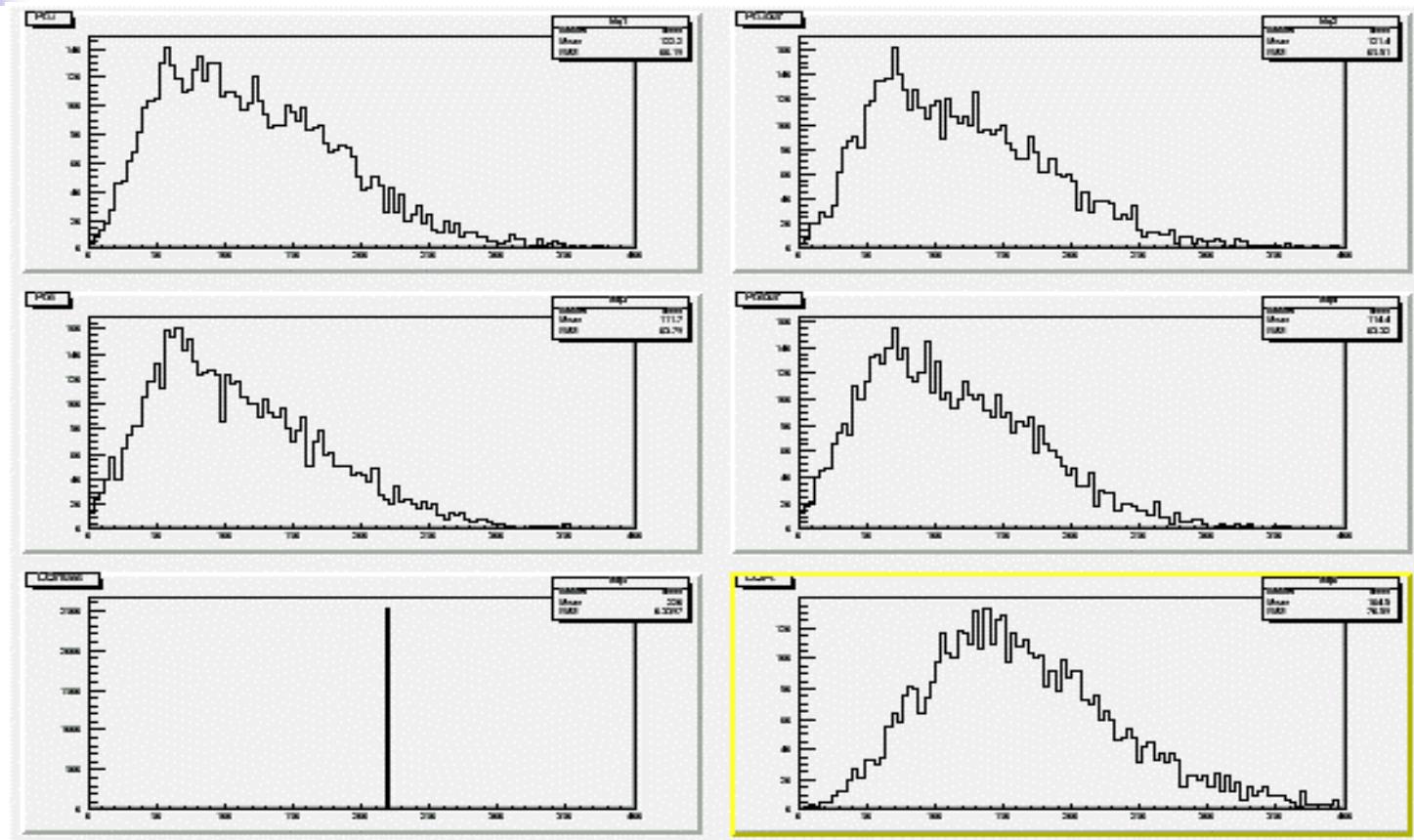
Simona Rolli Exotic meeting



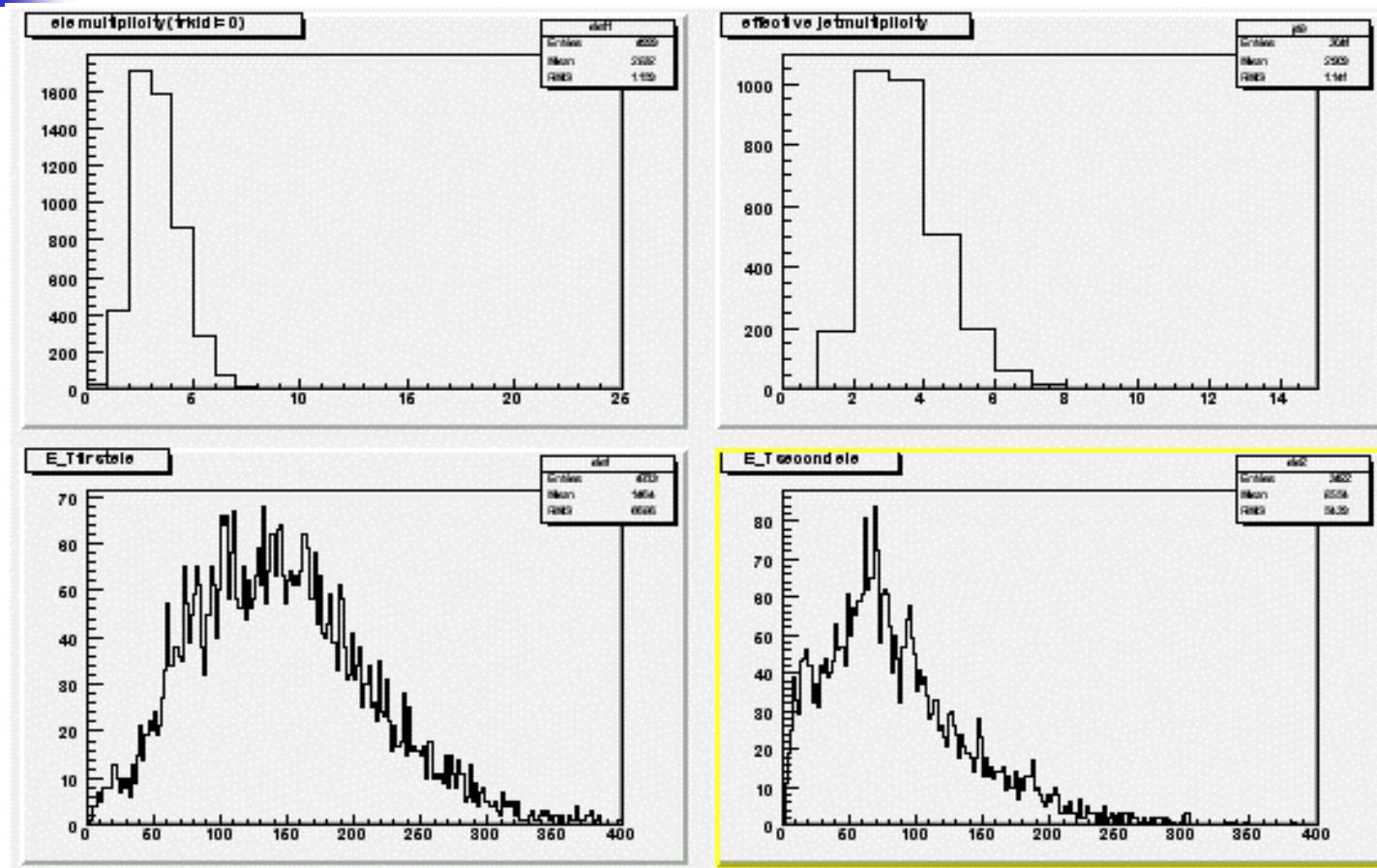
Tools

- Signal generated and reprocessed with 4.9.1
 - 5000 events at masses from 200 to 320
 - run number 151435
 - full beam position
 - talk GenPrimVert
 - BeamlineFromDB set false
 - sigma_x set 0.0025
 - sigma_y set 0.0025
 - sigma_z set 28.0
 - pv_central_x set -0.064
 - pv_central_y set 0.310
 - pv_central_z set 2.5
 - pv_slope_dxdz set -0.00021
 - pv_slope_dydz set 0.00031
 - exit
- eN (4.9.1)used for ntuple analysis
 - <http://ncdf70.fnal.gov:8001/talks/eN/eN.html>

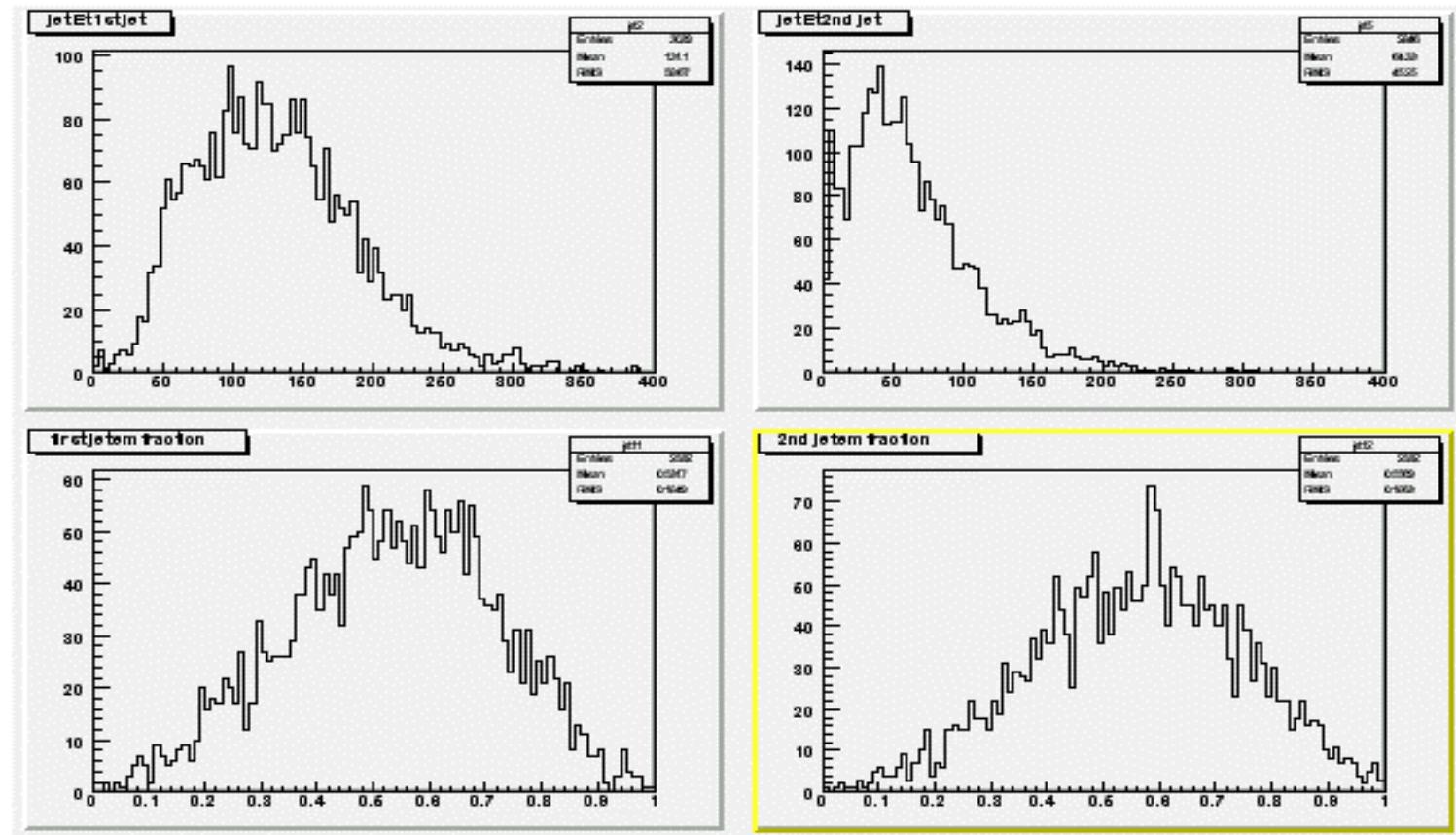
MC distributions ($M_{LQ} = 220$)

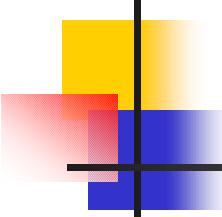


MC distributions ($m_{LQ} = 220$)



MC distributions (con'td)



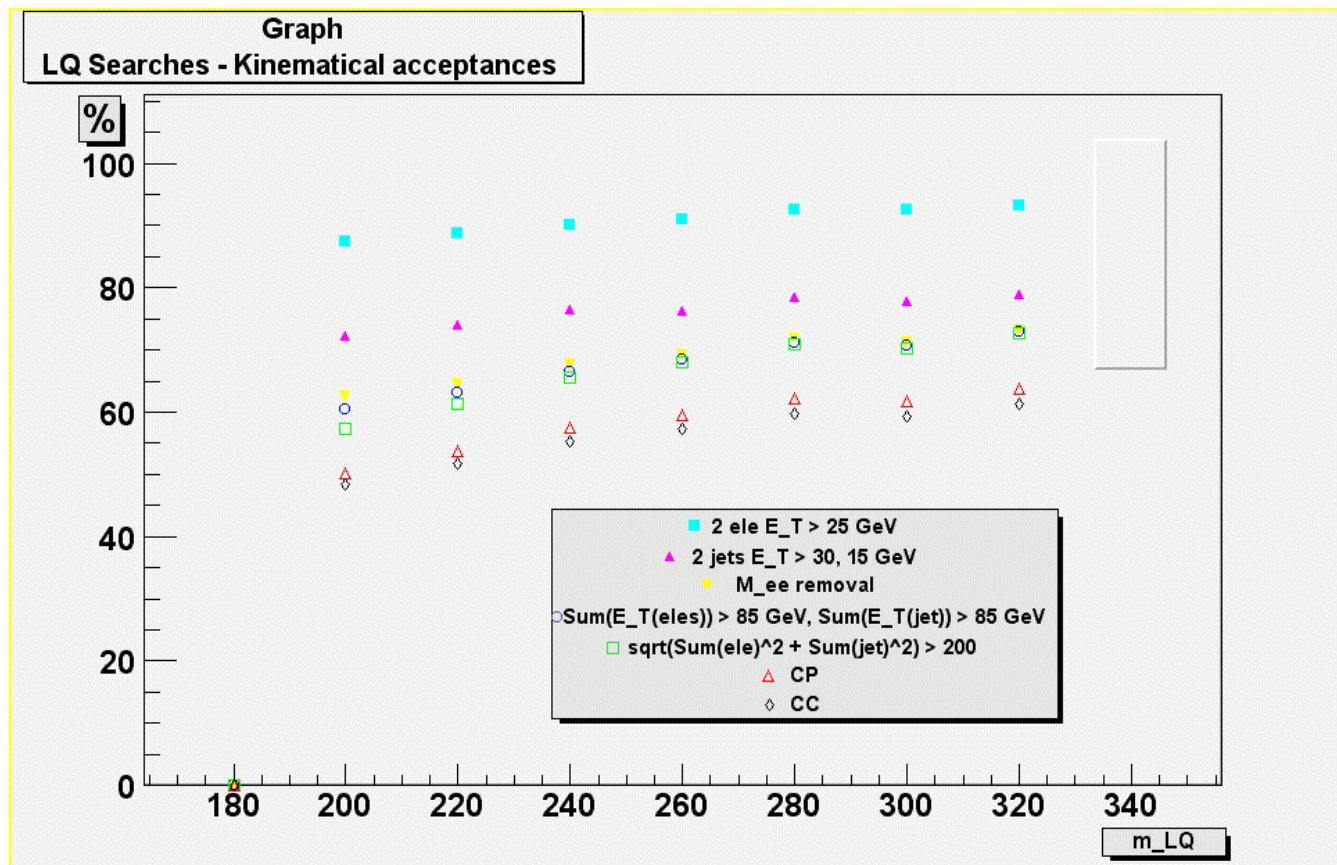


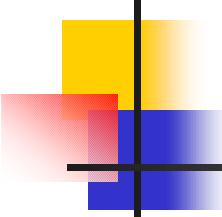
Efficiencies & acceptance

$$\epsilon_{\text{tot}} = \epsilon_{\text{Acc}}(M) \times \epsilon_{\text{ID}} \times \epsilon_{z0} \times \epsilon_{\text{trig}}$$

- Trigger
 - Top/EW - Z^{γ} analysis quotes $94.5 \pm 0.5\%$
- Efficiencies for electron selection cuts
 - cdf_6080 - Z' analysis -
 - possibly using new baseline cuts
- Other
 - efficiency on the vertex cut ($|z_0| < 60$ cm)
 $94.0 \pm 2.0\%$ (last summer value)

Total acceptance





Electron ID (Z' analysis)

- Central electron (loose or tight)

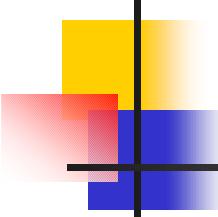
- $E_t \geq 25 \text{ GeV}$
- $p_t > 13 \text{ GeV}$
- $\text{hadem} \leq 0.055 + 0.00045 * E$
- $E/p < 4$ (for $Pt < 50 \text{ GeV}$)
- $\text{iso4e}/\text{emet} < 0.1$ (0.2 for second central loose)
- $|\Delta x| < 3.0$
- $|\Delta z| < 5.0 \text{ cm}$
- Fiducial = 1

$$\epsilon_{CC} = 87.7 \pm 0.9\%$$

$$\epsilon_{CP} = 84.4 \pm 0.8\%$$

Second Loose ele plug

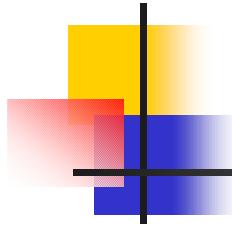
- $E_t \geq 25 \text{ GeV}$
- Isolation < 0.1
- $\text{hadem} \leq 0.055 + 0.00045 * E$
- Fiducial $1 < |\eta| < 3$



Total kinematical acceptance

M_{LQ} (GeV/c ²)	200	220	240	260	280	300	320
2 ele with $E_T > 25$ GeV	0.873±0.006	0.888±0.005	0.905±0.005	0.911±0.005	0.925±0.004	0.924±0.004	0.932 ±0.004
2 jets with $E_T > 30, 15$ GeV	0.723±0.008	0.740±0.007	0.768±0.008	0.763±0.007	0.785±0.007	0.777±0.007	0.790± 0.006
M_{ee} removal cut	0.625±0.009	0.644±0.008	0.685±0.008	0.690±0.008	0.712±0.008	0.711±0.008	0.731± 0.008
$\Sigma(E_T(\text{ele}_i)) > 70$ GeV & $\Sigma(E_T(\text{jet}_i)) > 70$ GeV	0.604±0.009	0.639±0.008	0.674±0.009	0.684±0.008	0.712±0.008	0.706±0.008	0.729± 0.008
$\Sigma(E_T(\text{ele}_i) + E_T(\text{jet}_i)) >$ 200	0.574±0.009	0.612±0.008	0.664±0.009	0.679±0.008	0.709±0.008	0.703±0.008	0.727± 0.008

	M_{LQ}	Exp(50 pb ⁻¹)	Exp (80 pb ⁻¹)
Number of	200	6.62	10.6
expected events	220	3.75	6.0
in 50 or 80 pb ⁻¹	240	2.18	3.5
(CC only)	260	1.23	1.96
	280	0.71	1.1
	300	0.4	.63
	320	0.23	.37

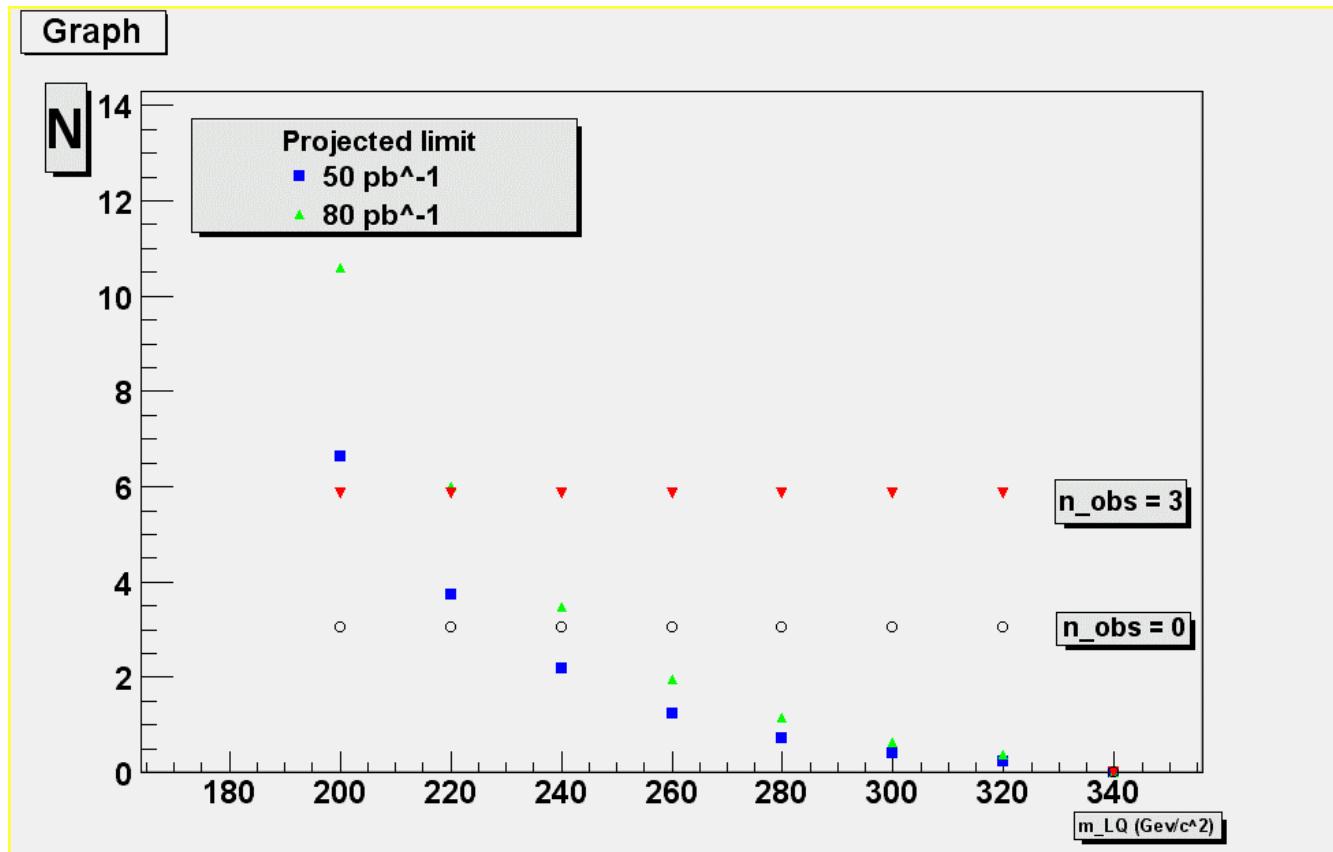


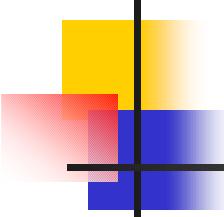
Background

- tt with both W $\rightarrow e\nu$ 0.18 ± 0.02
 - pythia
- DY + 2 jets 2.77 ± 0.9
 - alpgen + PS

Projected Limit (CC only)

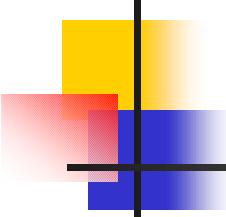
220 if
 $n_{\text{obs}} = 0$





Data sample

- btop0g (inclusive electrons) stripped from bheI08 and (4.8.4 Production)
- events selected from Ele_18 && Ele_70 triggers
- TrackRefitModule rerun from 4.9.1hpt1
- EmObject track pointers restored using UltimateChild()
 - 2 isolated electrons
 - One tight (central)
 - One loose (central or plug)
 - At least 2 energetic jets



Data sample

```
module clone Prereq HPTE
module enable Prereq-HPTE
module talk Prereq-HPTE
L1Accept set true
L2Accept set true
L3Accept set false
L3TriggerNames set ELECTRON70_L2_JET \
                 ELECTRON_CENTRAL_18 \
                 ELECTRON_CENTRAL_18_NO_L2 \
                 W_NOTRACK \
                 W_NOTRACK_NO_L2 \
                 Z_NOTRACK
debug set false
exit
exit
```

```
module clone StripSingleE HPE2
module enable StripSingleE-HPE2
module talk StripSingleE-HPE2
elePtMin set 15.0
etCalMin set 70.0
delXMin set 3.0
delZMin set 5.0
show
exit
```

```
module clone StripSingleE HPE1
module enable StripSingleE-HPE1
module talk StripSingleE-HPE1
elePtMin set 9.0
etCalMin set 18.0
delXMin set 3.0
delZMin set 5.0
EoPMax set 4.0
lshrMax set 0.3
hademMax set 0.125
show
```

Plans

- Looking at data
 - REMAKE inclusive electron sample
- systematics

1 st Gen.	β	Scalar (GeV/c)	Vector Minimal Coupling (GeV/c)	Vector Yang-Mills Coupling (GeV/c)
DZero	1	225(242)	292	345
	0.5	204	282	337
	0	98	238	298
CDF	1	220(242)	280	330
	0.5	202	265	310

25% increase in the cross section
~factor 1/3 less luminosity
acceptances slightly higher

